[JP,2004-140194,A]

CLAIM + DETAILED DESCRIPTION

[Claim(s)]
[Claim 1]
The 1st film which consisted of electric conduction objects,
The 2nd film which consisted of resistance objects,
The 3rd film which has been arranged between said 1st film and said 2nd film, and consisted of conductors,
Preparation **********.
[Claim 2]
As for said 3rd film, predetermined distance is a wave absorber according to claim 1 characterized by what it is arranged in the distant position and consists of films with which two or more openings were formed from two or more films arranged in the shape of a matrix in the position distant [predetermined distance] from the 1st film, or said 1st film.
[Claim 3]
Said 3rd film is Claim 1 characterized by having the two or more layers layer of the conductor arranged between said 1st film and the 2nd film, and a wave absorber according to claim 2.
[Claim 4]
A wave absorber given in any 1 clause of the Claims 1-3 characterized by having the dielectric arranged between said 1st film, the 3rd film and the 3rd film, and the 2nd film.

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the wave absorber which was excellent in absorption of the electromagnetic waves of two or more frequency especially about the wave absorber which absorbs specific electromagnetic waves that the electromagnetic wave disclosure to outer space should be intercepted, controlling a reflection of electromagnetic waves.
[0002]
[Description of the Prior Art]

At office, a factory, etc., wireless LAN (Local Area Network) is used for information exchange. However, only by introducing wireless LAN simply When electromagnetic waves leak outside, proprietary information is revealed outside or electromagnetic waves reflect at office, a wall, a ceiling of a factory, etc., into space, it remains without a reflective wave declining and communication environment is worsened, the rate of a mark error may become high, or a communication-of-information rate may fall.
[0003]
In order to correspond to the above-mentioned problem, 1 / 4lambda type wave absorber which absorbs the electromagnetic waves of the specific frequency used for wireless communications are developed.
As shown in drawing 11 , 1 / 4lambda type wave absorber 31 consists of the films or cloth (it is hereafter called the resistance film.) 35 which applied the electrical resistance object which kept the interval DB of 1/4lambda (lambda is the wavelength of the electromagnetic waves for absorption) in metallic foil 33 and the resistance film 35, and has been countered and arranged.
[0004]
1 / 4lambda type wave absorber 31 explains the principle which absorbs electromagnetic waves with reference to drawing 12 . Electromagnetic wave (b) of the wavelength lambda which entered into the resistance film 35 penetrates the resistance coat 35, and by the time it reaches metallic foil 33, 90 degrees of phases will change. It is reflected by metallic foil 33 and a phase reverses electromagnetic wave (b). Therefore, electromagnetic wave (b) has caused 90 degrees +180 degrees = 270 degrees phase change as compared with the time of passing the resistance film 35 at this time. While incidence electromagnetic wave (b) reflected with metallic foil 33 returns to the position of the resistance film 35, a 90 more degree phase changes. Therefore, the phase contrast of electromagnetic wave (b) and electromagnetic wave (a) which entered later becomes 360 degrees, and previous incidence wave (b) and next incidence wave (a) serve as the same phase relations. As a result, electromagnetic wave (a) and (b) suit in slight strength mutually, and the intensity of electromagnetic waves obtains maximum in the position of the resistance film 35. Then, the energy of electromagnetic waves is efficiently absorbed by the resistance film 35, and finally changes to heat, and a reflection of electromagnetic waves is canceled.
[0005]
The result of evaluation with the frequency of 1 / 4lambda type wave absorber 31 when the interval DB of metallic foil 33 and the resistance film 35 is 16mm, and reflective loss is shown in drawing 13 . "Reflection loss" of the vertical axis of drawing 13 shows the rate of reflective field intensity to incidence field intensity, and is calculated as "Reflection loss" =20x(common logarithms) x (incidence field intensity / reflective field intensity). Moreover, a horizontal axis shows the frequency of incidence electromagnetic waves.
[0006]
In conventional 1 / 4lambda type wave absorber 31, as drawing 11 shows, only the electromagnetic waves of a specific wavelength are absorbable (refer to patent documents 1).
[0007]
Two or more frequency bands of a 2.4GHz belt (lambda= 125mm) and a 5.2GHz belt

(lambda= 57.7mm) are used for wireless LAN communication now. Under such environment, conventional 1 / 4lambda type wave absorber 31 can only perform absorbing the electric wave of one of frequency bands, but must prepare two or more absorbers according to frequency. However, it is disadvantageous also in cost complicated to manufacture and arrange 1 / 4lambda type wave absorber 31 according to the frequency of electromagnetic waves.

[0008]

Moreover, if structure of a wave absorber is complicated, dealing with two or more frequency is possible, and structure will be complicated, it will enlarge, manufacture will become difficult, and manufacture cost will also become high further.

[0009]

[The patent documents 1]

JP,5-114813,A gazette

[0010]

[Problem to be solved by the invention]

It was made in order that this invention might solve the above-mentioned conventional fault, and it aims at offering alone the wave absorber which can respond to a multifrequency belt.

Moreover, with easy structure, this invention sets it as other purposes to offer the wave absorber which can absorb the electromagnetic waves of wave band two or more rounds, though it is small.

[0011]

[Means for solving problem]

This invention is a wave absorber equipped with the 3rd film which consisted of conductors between the 1st film which was made in order to attain the above-mentioned purpose, and consisted of electric conduction objects, the 2nd film which consisted of resistance objects, and said 1st film and said 2nd film.

[0012]

Said 3rd film is arranged in the position distant [predetermined distance] from two or more films arranged in the shape of a matrix in the position distant [predetermined distance] from the 1st film, or said 1st film, and consists of films with which two or more openings were formed, for example.

[0013]

Moreover, said 3rd film may be equipped with the two or more layers layer of the conductor arranged between said 1st film and the 2nd film.

[0014]

You may have the dielectric arranged between said 1st film, the 3rd film and the 3rd film, and the 2nd film.

[0015]

[Mode for carrying out the invention]

The wave absorber concerning the embodiment of this invention is hereafter explained with reference to Drawings.

The wave absorber 11 of the form of this operation is an exploded perspective view, as shown in drawing 1 . The resistance film 15 of the rectangle which countered rectangular conductive foil 13 and conductive foil 13 mostly, and has been arranged as shown to drawing 2 in a side view, It consists of conductive foil 13, a conductor layer 17 arranged

between the resistance films 15, resin 19 (drawing 2) filled up with between these, and a protection layer (not shown) which covers these whole.
[0016]
Conductive foil 13 is formed from the film of the rectangle of metal, such as copper which is the perfect reflector of an electric wave, aluminum, or those alloys, for example, is formed in 1m and 100 micrometers - 1mm in thickness from 30cm of every direction.
[0017]
The resistance coat 15 is size almost equal to conductive foil 13, it is arranged in the position distant from conductive foil 13 16mm, and an electric conduction rate consists of films of 5 S/m. the film with which the resistance film 15 applied the oxide of the metal of precious-metals salt, such as Cu alloy films, such as Manganin which is an electrical resistance object, a precious alloy film, a carbon film, or Pt-Au-Pb, or SnO2 grade etc., for example, or cloth -- it is ** constituted.
[0018]
two or more conductors of the square whose length of one side of a conductor layer 17 is 150mm -- mutually, Film 17a makes it arrange in the shape of a matrix at intervals of 20mm in position of 3mm, and is constituted from conductive foil 13. each -- a conductor -- Film 17a consists of metal, such as copper which is the perfect reflector of an electric wave, aluminum, and those alloys, like conductive foil 13.
[0019]
It filled up with resin 19 between conductive foil 13 and a conductor layer 17 and between the conductor layer 17 and the resistance coat 15, for example, a dielectric constant consists of resin of 1.1-1.3, such as styrene foam.
[0020]
The protection layer which is not illustrated consists of resin, such as a plastic, and covers and protects the wave absorber 11 whole. The wave absorber 11 is constituted by rectangular tabular one with an every direction [30cm - 1m of], and a thickness of about 18-22mm.
[0021]
Next, the production method of this wave absorber is explained with reference to drawing 3 (a) - (c).
First, a dielectric constant prepares the styrene foam board 19a of 1.1-1.3 at 3mm in thickness. As shown in drawing 3 (a), the conductive foil 13 of the same size is mostly pasted up on one principal surface of the styrene foam board 19a with this styrene foam board 19a. next, the conductor of the square whose one side is 150mm as shown in the other principal surfaces of the styrene foam board 19a at drawing 3 (b) -- Film 17a is arranged and pasted up at intervals of 20mm.
[0022]
On the other hand, the 13-mm-thick styrene foam board 19b is prepared with the almost same size and quality of the material as the styrene foam board 19a. This resistance film 15 is pasted up on one principal surface of this styrene board 19b.
[0023]
Next, the other principal surfaces of the styrene foam board 19a and the other principal surfaces of the styrene foam board 19b are pasted up as shown in drawing 3 (c).
Then, the whole is covered with the protective film which consisted of resin etc. if needed.

[0024]
The electric wave absorption feature of the wave absorber 11 of the above-mentioned composition is shown in drawing 4 .
This characteristic irradiates a 2-6GHz electromagnetic wave at right angles to the wave absorber 11, and it is acquired from the resistance film 15 side by measuring "Reflection loss" in each frequency. Furthermore, "Reflection loss" of the conventional 1 / 4lambda type wave absorber 31 shown in drawing 11 is shown in drawing 4 for comparison.
[0025]
[in conventional 1 / 4lambda type wave absorber 31, demonstrate the reflective wave oppression characteristic only in the electromagnetic waves of one specific frequency band so that clearly from the characteristic shown in drawing 4 , but] The wave absorber 11 of this embodiment demonstrates the good reflective wave oppression characteristic in the electromagnetic waves of two wave bands, a 2.4GHz belt and a 5.2GHz belt.
[0026]
Therefore, the wave absorber 11 of this embodiment can respond to two wave bands of the 2.4GHz belt and 5.2GHz belt which are a simple substance and are a frequency band currently assigned to wireless LAN.
[0027]
If this point is explained theoretically, the equivalent electric circuit which caught conventional 1 / 4lambda type wave absorber 31 from the viewpoint of electromagnetic waves will become like drawing 5 . The equivalent electric circuit (equivalent circuit) of drawing 5 consists of resistance R35 connected to Terminal a and Terminal b, impedance Z0 connected to Terminal a, and impedance Z0 connected to Terminal b, and impedance Z0 comrades are connected mutually. Resistance R is equivalent to the resistance film 35, and impedance Z0 is impedance which delays 90 degrees of phases of incidence **** in conductive foil 33.
[0028]
On the other hand, the equivalent circuit of the wave absorber 11 concerning the form of this operation is expressed as what added the impedance Zx other than the impedance Z0 of the equivalent circuit of drawing 5 , as shown in drawing 6 . The resistance R13 by which the equivalent electric circuit (equivalent circuit) of drawing 6 was connected to Terminal a and Terminal b, The impedance ZX connected to Terminal a, and the impedance Z0 connected to Impedance ZX, It consists of impedance ZX connected to Terminal b, and impedance Z0 connected to Impedance ZX, and impedance Z0 comrades are connected mutually. Resistance R is equivalent to the resistance film 15, impedance Z0 is impedance which delays 90 degrees of phases of incidence **** in conductive foil 13, and Impedance Zx is impedance formed of conductive foil 13 and a conductor layer 17.
[0029]
When incidence frequency is 5.2GHz, since the equivalent circuit of drawing 6 becomes so small that Impedance Zx can ignore compared with impedance Z0, it becomes almost equal to the equivalent circuit of drawing 5 . Therefore, about incidence frequency, as shown in drawing 4 , the wave absorber 11 can show the same tendency as conventional 1 / 4lambda type wave absorber 31, and can absorb effectively the electromagnetic waves of the incidence frequency of a 5.2GHz belt.
[0030]

On the other hand, when incidence frequency is 2.4GHz, since the interval of conductive foil 13 and the resistance film 15 is shorter than 1/4lambda, 360 degrees of phases of incidence **** cannot be changed only by impedance Z0. however -- Impedance Zx complements impedance Z0 in this case -- such synthetic impedance Z1 (= Z0+ZX) -- 360 degrees of phases of incidence **** can be changed as a whole. Therefore, the wave absorber 11 can also absorb effectively the electromagnetic waves of the incidence frequency of a 2.4GHz belt, as shown in drawing 4 .
Moreover, it can form in a thin shape rather than the conventional 1 / 4lambda type wave absorber corresponding to a 2.4GHz belt from the ability of an absorption effect to be acquired as mentioned above, even if the interval of conductive foil 13 and the resistance film 15 is shorter than 1/4lambda.
[0031]
Therefore, irrespective of the frequency band currently used in this wave absorber 11 the whole surface of the indoor wall surface which is using wireless LAN, a floor, and a ceiling, or by arranging in part, a reflection of electromagnetic waves is suppressed and good communication environment can be maintained. And disclosure of the electromagnetic waves to the exterior can also be prevented. Moreover, composition is very easy and lightweight and thickness can also be formed comparatively thinly.
[0032]
In addition, this invention is not limited to the form of the above-mentioned implementation, but various modification and application are possible for it. 2.4GHz of frequency band belt and the 5.2GHz belt a numerical value and for absorption which were shown in the above-mentioned embodiment are an example, and it can change arbitrarily. Furthermore, the interval of 16mm of conductive foil 13 and the resistance film 15, the interval of 3mm of conductive foil 13 and a conductor layer 17, etc. can be arbitrarily changed according to the frequency band for absorption, the dielectric constant of resin 19, etc. the conductor which similarly constitutes a conductor layer 17 -- size 150mmx150mm and its interval of 20mm of Film 17a can be suitably changed according to the frequency band used as the candidate for absorption, the absorption feature for which it wishes, etc. moreover, a conductor -- the form of Film 17a may be a triangle, a round shape, etc., as it is not limited to a rectangle but is shown in drawing 7 (a) - (b).
[0033]
Moreover, a conductor layer 17 is not constituted from two or more conductor layers, but you may consist of conductive meshes. for example, mesh (net)-like the conductor of one sheet with which openings, such as a rectangle, a triangle, and a round shape, were formed as shown in drawing 8 (a) - (c) -- you may form a conductor layer 17 from a film.
[0034]
Furthermore, this invention is not limited to an electromagnetic wave absorber equipped with two electric wave absorption zones, and can respond also to a thing equipped with three or more absorption wave bands. In this case, what is necessary is just to arrange the two or more layers conductor layer 17 between conductive foil 13 and the resistance film 15 according to the number of frequency and frequency for attenuation, for example, as a section shows to drawing 9 (a) and (b). By choosing the size and the arrangement position of a conductor layer 17 inserted in the intermediate layer of a wave absorber, it is possible to make various wave bands into an absorption zone. For example, if the conductor layer 17 of n layer is arranged between conductive foil 13 and the resistance

film 15, the wave absorber which can respond to n+1 wave band is realizable.
[0035]
Moreover, you may enable it to absorb the electromagnetic waves of much frequency by arranging the conductor layer 17 from which form and size differ on the wave absorber 11, as shown in drawing 10 .
[0036]
Although the form of the above-mentioned implementation showed the example which uses the firing steel version as resin 19, the quality of the material of resin 19 is arbitrary. If it is possible to make a wave absorber still thinner if the quality of the material with a high dielectric constant is used, for example, the plus chip resin which mixed high dielectrics, such as barium titanate, Rochelle salt, or lead zirconate, is used as resin 19, the wave absorber 11 several millimeters thick can also be manufactured.
[0037]
in addition, the electromagnetic waves absorbed by the wave absorber of this invention although explanation in particular was not given until now -- vertical polarization, horizontal polarization, and a circular polarization -- which electromagnetic waves are sufficient. For this reason, the wave absorber of this invention is applicable not only to the electromagnetic waves of the vertical polarization emitted from wireless LAN, or horizontal polarization but the electromagnetic waves of the circular polarization emitted from BS (Broadcasting Satellite) broadcast etc.
[0038]
[Effect of the Invention]
As explained to details above, according to this invention, it becomes realizable [the wave absorber which can respond to a multifrequency belt]. Moreover, in industrializing, since it is easy structure, it is very advantageous.
[Brief Description of the Drawings]
[Drawing 1] It is the exploded perspective view of the wave absorber concerning the form of implementation of this invention.
[Drawing 2] It is the sectional view seen from the side of the wave absorber shown in drawing 1 .
[Drawing 3] (a) - (c) is a flowchart for explaining the production method of the wave absorber of composition of being shown in drawing 1 and drawing 2 .
[Drawing 4] It is the figure showing the characteristic of the wave absorber concerning the form of operation, and the characteristic of the conventional wave absorber by comparison.
[Drawing 5] It is the representative circuit schematic of the conventional wave absorber.
[Drawing 6] It is the representative circuit schematic of the wave absorber concerning the form of operation.
[Drawing 7] It is the figure showing the modification of the conductor layer shown in drawing 1 and drawing 2 .
[Drawing 8] It is the figure showing the modification which constituted the conductor layer from a mesh.
[Drawing 9] It is the figure showing the modification which made the conductor layer multilayer structure.
[Drawing 10] It is the figure showing the modification which formed the structure of the conductor layer so that it might differ in a field.

[Drawing 11] It is the exploded perspective view of the conventional 1 / 4lambda type wave absorber.
[Drawing 12] It is a figure for the conventional 1 / 4lambda type wave absorber to explain the principle which absorbs electromagnetic waves.
[Drawing 13] It is the characteristic figure of the conventional 1 / 4lambda type wave absorber.
[Explanations of letters or numerals]
11 Wave Absorber
13 Conductive Foil
15 Resistance Film
17 Conductor Layer
19 Resin

[Translation done.]